

ABSTRACT

The enzyme, iron hydrogenase (HydA), has industrial applications for the production of hydrogen, specifically, for catalyzing the reversible reduction of protons to molecular hydrogen. The present invention relates to the isolation of a nucleic acid sequence from the algae *Scenedesmus obliquus*, *Chlamydomonas reinhardtii*, and *Chlorella fusca* that encodes iron hydrogenase. The invention further discloses the genomic nucleic acid, c-DNA and the protein sequences for HydA. The genes and gene products may be used in a photosynthetic process for hydrogen production which includes growing a microorganism containing the gene coding for HydA in a culture medium under illuminated conditions sufficient to accumulate an endogenous substrate; depleting a nutrient selected from the group consisting of sulfur, iron, and manganese from the medium; then allowing the culture to become anaerobic by consumption of an endogenous or exogenous substrate in the light.